

Name: Key

Date: _____

Unit 4, IB Quiz

Solve the following problems using the ideal gas law. ($R = 0.08206 \text{ dm}^3 \cdot \text{atm} / \text{mol} \cdot \text{K}$)
Show all work!

$$8.31 \text{ dm}^3 \text{ KPa} / \text{mol} \cdot \text{K}$$

1. How many moles of gas does it take to occupy 120 dm^3 at a pressure of 2.3 atmospheres and a temperature of 340 K? (2 points)

$$P = 2.3 \text{ atm}$$

$$V = 120 \text{ dm}^3$$

$$n = ?$$

$$R = 0.08206 \text{ dm}^3 \text{ atm} / \text{mol} \cdot \text{K}$$

$$T = 340 \text{ K}$$

$$PV = nRT$$

$$(2.3 \text{ atm})(120 \text{ dm}^3) = n(0.08206)(340 \text{ K})$$

$$n = 9.89 \text{ mol}$$

2. If I have a 50 dm^3 container that holds 45 moles of gas at a temperature of 200°C , what is the pressure inside the container? (2 points)

$$V = 50 \text{ dm}^3$$

$$n = 45 \text{ mol}$$

$$T = 200^\circ \text{C} + 273 \text{ K} = 473 \text{ K}$$

$$P = ?$$

$$R = 8.31 \text{ dm}^3 \text{ KPa} / \text{mol} \cdot \text{K}$$

$$P(50 \text{ dm}^3) = (45 \text{ mol})(8.31)(473 \text{ K})$$

$$P = 3537.6 \text{ KPa}$$

3. I have a balloon that can hold 100 dm^3 of air. If I blow up this balloon with 3 moles of oxygen gas at a pressure of 1 atmosphere, what is the temperature of the balloon? (2 points)

$$V = 100 \text{ dm}^3$$

$$n = 3 \text{ mol}$$

$$P = 1 \text{ atm}$$

$$T = ?$$

$$R = 0.08206 \text{ dm}^3 \text{ atm} / \text{mol} \cdot \text{K}$$

$$(1 \text{ atm})(100 \text{ dm}^3) = (3 \text{ mol})(0.08206)T$$

$$T = 406.2 \text{ K}$$

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4. How many moles of gas are in a 30 dm³ scuba canister if the temperature of the canister is 300 K and the pressure is 200 atmospheres? **(2 points)**

$$V = 30 \text{ dm}^3$$

$$P = 200 \text{ atm}$$

$$T = 300 \text{ K}$$

$$n = ?$$

$$R = .08206 \text{ dm}^3 \text{ atm} / \text{mol K}$$

$$(200 \text{ atm})(30 \text{ dm}^3) = n (.08206)(300 \text{ K})$$

$$n = 243.7 \text{ mol}$$

5. It is not safe to put aerosol canisters in a campfire, because the pressure inside the canisters gets very high and they can explode. If I have a 1.0 dm³ canister that holds 2 moles of gas, and the campfire temperature is 1400 °C, what is the pressure inside the canister? **(2 points)**

$$V = 1.0 \text{ dm}^3$$

$$n = 2 \text{ mol}$$

$$T = 1400^\circ\text{C} + 273 \text{ K} = 1673 \text{ K}$$

$$P = ?$$

$$R = 8.31 \text{ dm}^3 \text{ kPa} / \text{mol K}$$

$$P(1 \text{ dm}^3) = (2 \text{ mol})(8.31)(1673 \text{ K})$$

$$P = 27805.3 \text{ kPa}$$